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REPRODUCTION IN THE WESTERN CORAL SNAKE, *MICRUROIDES EURYXANTHUS* (ELAPIDAE), FROM ARIZONA AND SONORA, MÉXICO

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The western coral snake, *Micruroides euryxanthus* (Kennicott, 1860), ranges from central Arizona and southwestern New Mexico to southern Sinaloa, México, and occurs from sea level to 1770 m (Stebbins 1985). Information on the biology of this species is in Roze (1974). There are only anecdotal accounts of reproduction in *M. euryxanthus* (Funk 1964, Behler and King 1979, Stebbins 1985, Ernst 1992, Williamson et al. 1994, Rossi and Rossi 1995, Degenhardt et al. 1996). According to Lowe et al. (1986), the *M. euryxanthus* reproductive cycle is tied to summer rains; egg laying occurs in July–August with hatchlings appearing in summer. Shaw (1971) assumed breeding occurred in the spring, with egg deposition in late spring or early summer. Roze (1996) reported that in Sonora, México, oviductal eggs were found in *M. euryxanthus* in the 2nd half of May and the end of July; egg laying stretched from the end of July to September. The purpose of this report is to provide information on reproduction in *M. euryxanthus*.

I report on data from 56 *Micruroides euryxanthus* (35 males, mean snout-vent length [SVL] = 382 mm ± 41.9 *s*, range 320–493 mm; 21 females, mean SVL = 371 mm ± 49.7 s, range 315–497 mm) from Arizona and Sonora, México, in the herpetology collections of the University of Arizona (UAZ), Tucson, and the Natural History Museum of Los Angeles County (LACM), Los Angeles (Appendix). Counts were made of oviductal eggs or enlarged follicles (>3 mm diameter). The left testis, epididymis, and vas deferens and part of the kidney were removed from males; the left ovary was removed from females for histological examination. Tissues were embedded in paraffin and cut into sections at 5 µm. Slides were stained with Harris' hematoxylin followed by eosin counterstain. Testes slides were examined to determine the stage of the male cycle; epididymides and vasa deferentia were examined for sperm. Slides of kidney sexual segments were examined for secretory activity. Ovary slides were examined for the presence of yolk deposition.

Data on the male *Micruroides euryxanthus* testicular cycle are presented in Table 1. Testicular histology was similar to that reported by Goldberg and Parker (1975) for the colubrid snakes *Masticophis taeniatus* and *Pituophis melanoleucus*. In the regressed testes seminiferous tubules contained spermatogonia and Sertoli cells. In recrudescence there was renewal of spermatogenic cells characterized by spermatogonial divisions; primary and secondary spermatocytes and spermatids may have been present. In spermiogenesis metamorphosing spermatids and mature sperm were present. Males undergoing spermiogenesis were found in all months examined (April–November; Table 1). Epididymides and vasa deferentia of spermiogenic males contained sperm. The smallest spermiogenic male measured 320 mm SVL. Only 2 males with regressed testes were found, 1 each in June (493 mm SVL) and August (330 mm SVL). No males with recrudescent testes were noted. The sexual segment of the kidney was enlarged and contained densely staining secretory granules in spermiogenic males. Mating coincides with hypertrophy of the kidney sexual segment (Saint Girons 1982).

The smallest reproductively active female (enlarging eggs) measured 356 mm SVL. To

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TABLE 1. Monthly distribution of conditions in seasonal testicular cycle of *Micruroides euryxanthus*. Values shown are the numbers of males with testes exhibiting each of the 2 conditions; none were in recrudescence.

Month	*N*	Regressed	Spermiogenesis
April	1	0	1
May	3	0	3
June	3	1	2
July	2	0	2
August	11	1	10
September	9	0	9
October	5	0	5
November	1	0	1

avoid the possibility of using immature females, I included only *Micruroides euryxanthus* of this size or larger in my analysis of the female reproductive cycle. One female from 31 May (356 mm SVL) contained 3 enlarging eggs (4–5 mm diameter). One female (440 mm SVL) from 23 June contained 6 oviductal eggs (6–7 mm diameter) which may represent the largest published clutch size for this species. Two females, 1 from 30 May (497 mm SVL) and 1 from 13 July (357 mm SVL), contained follicles in early vitellogenesis (yolk granules present). The other females examined were not reproductively active. This included 1 female from May (374 mm SVL), 1 from June (370 mm SVL), 1 from July (386 mm SVL), 2 from September (SVLs 381 mm, 393 mm), 2 from October (SVLs 363 mm, 493 mm). Funk (1964) reported 2 oviductal eggs in a single *M. euryxanthus* from Pima County, Arizona, collected 20 July. Stebbins (1985), Williamson et al. (1994), Rossi and Rossi (1995), and Degenhardt et al. (1996) reported that clutches contained 2–3 eggs. My female sample size is too small to speculate on what proportion of the female population produces eggs each year. However, my finding of 1 May and 1 June females with inactive ovaries may suggest that not all females reproduce annually. The female from July with inactive ovaries (no yolk deposition) may have already deposited eggs. It will be necessary to examine more female *M. euryxanthus* before a conclusive statement can be made. Quinn (1979) found oviductal eggs in only 2/74 (3%) female *Micrurus fulvius tener* from Texas. Only a portion of the female population breeds in other snakes from the North American desert (Goldberg 1995a, 1995b, 1995c, 1996, 1997).

My limited data on the *Micruroides euryxanthus* ovarian cycle appear compatible with the time frame for egg laying suggested by Lowe et al. (1986) for Arizona (July–August) and Roze (1996) for Sonora, México (end of July to September). Quinn (1979) reported that a few females of the Texas coral snake, *Micrurus fulvius tener*, laid eggs in May but most were deposited in June. September newborn *M. euryxanthus* measured 190–200 mm (total length) and weighed 1.5 g (Lowe et al. 1986).

Spermiogenesis occurred in all months in which testes of *Micruroides euryxanthus* were examined (April–November). This may suggest that spermiogenesis is continuous and that males are capable of breeding throughout the year; this would support Rossi and Rossi (1995), who stated that mating may occur in the fall as well as in spring. Quinn (1979) similarly reported an extended period of spermiogenesis (all months except May, June, and July) in *Micrurus fulvius tener*. The reproductive cycle of *M. euryxanthus* appears to fit into Saint Girons' (1982) category "spermatogenesis of mixed type A," in which there is mating in fall and spring with a long period of spermiogenesis.

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APPENDIX

Specimens examined from herpetology collections at the Natural History Museum of Los Angeles County (LACM) and the University of Arizona (UAZ). **Sonora, México:** LACM 16056, 104325. UAZ 9358, 27079, 35214, 44875–76, 45202–203, 45904. **Arizona, Cochise:** UAZ 14435, 14616, 39679, 39681, 45843, 46378, 46834, 50046. **Gila:** 43287. **Pima:** UAZ 9360, 14429–31, 14433, 14436, 14438–39, 14441–42, 14445–46, 14451, 14618–19, 27075, 29658, 34459, 35829, 36557, 37831, 40874, 42608, 45011, 46420, 47344, 47432, 47484, 48342, 48784. **Pinal:** UAZ 14432, 14434, 14444. **Santa Cruz:** UAZ 39677. **Yavapai:** UAZ 14443, 39669, 45748.